

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
31 December 2003 (31.12.2003)

PCT

(10) International Publication Number
WO 2004/001881 A2

- (51) International Patent Classification⁷: **H01M 4/58**
- (21) International Application Number:
PCT/EP2003/006628
- (22) International Filing Date: 19 June 2003 (19.06.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
02291562.3 21 June 2002 (21.06.2002) EP
60/392,978 2 July 2002 (02.07.2002) US
- (71) Applicants (*for all designated States except US*): UMI-CORE [BE/BE]; Rue du Marais 31, B-1000 Brussels (BE). LE CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE [FR/FR]; 3, Rue Michel Ange, F-75794 Paris Cedex 16 (FR).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): AUDEMER, Albane [FR/BE]; Kasteelstraat 7, B-2250 Olen (BE). WURM, Calin [FR/FR]; 3, rue Michel Ange, F-75794 Paris Cedex 16 (FR). MORCRETTE, Mathieu [FR/FR]; 3, rue Michel Ange, F-75794 Paris Cedex 16 (FR). GWIZDALA, Sylvain [FR/FR]; 3, rue Michel Ange, F-75794 Paris Cedex 16 (FR). MASQUELIER, Christian [FR/FR]; 3, rue Michel Ange, F-75794 Paris Cedex 16 (FR).
- (74) Common Representative: PILATE, André; Umicore - Patent Department, Kasteelstraat 7, B-2250 Olen (BE).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Declaration under Rule 4.17:**
— *of inventorship (Rule 4.17(iv)) for US only*
- Published:**
— *without international search report and to be republished upon receipt of that report*
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: CARBON-COATED LI-CONTAINING POWDERS AND PROCESS FOR PRODUCTION THEREOF

(57) Abstract: The invention provides a new route for the synthesis of carbon-coated powders having the olivine or NASICON structure, which form promising classes of active products for the manufacture of rechargeable lithium batteries. Carbon-coating of the powder particles is necessary to achieve good performances because of the rather poor electronic conductivity of said structures. For the preparation of coated LiFePO_4 , sources of Li, Fe and phosphate are dissolved in an aqueous solution together with a polycarboxylic acid and a polyhydric alcohol. Upon water evaporation, polyesterification occurs while a mixed precipitate is formed containing Li, Fe and phosphate. The resin-encapsulated mixture is then heat treated at 700 °C in a reducing atmosphere. This results in the production of a fine powder consisting of an olivine LiFePO_4 phase, coated with conductive carbon. When this powder is used as active material in a lithium insertion-type electrode, fast charge and discharge rates are obtained at room temperature and an excellent capacity retention is observed.



WO 2004/001881 A2